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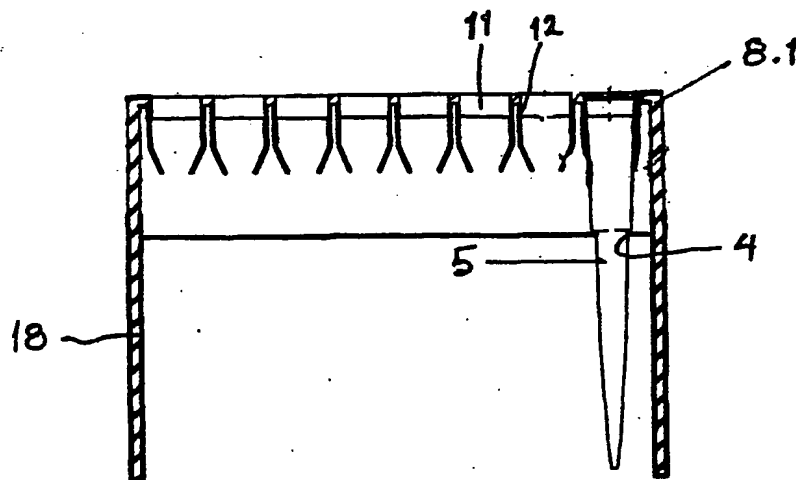
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(54) Title: REFILL PACK WITH A PLATE



(57) Abstract: A pipette tip refill pack, comprising layers of tips (5) stacked in a telescopic fashion and a push plate (8.1) with an aperture (11) for each stack of tips, which push plate can be moved through the layers of tips so that the aperture slides over the tip from the narrower end to and past the larger end thereof. The aperture (11) is provided with longitudinal springs (12), which support the tip in the aperture and extend from the edge of the aperture towards the narrower end of the tip (5).

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REFILL PACK WITH A PLATE

Field of the invention

The invention belongs to the field of laboratory technology and relates to a refill
5 pack with a plate for a pipette tip rack, by means of which pack an empty rack can
be refilled. A pipette can then be provided with new tips from the rack.

Background of the invention

Pipettes that are conventionally used in laboratories comprise a replaceable tip
container or tip, where the substance to be dosed is sucked in. The tip is usually
10 conical and is attached by friction to the respectively conical bottom end of the
pipette suction cylinder. Conventionally the tips are fastened manually to the pipette.
Usually the tips have a wider top parts, and thus they can be placed also in holes
provided in a particular tip rack, said holes being smaller than said wider top parts.
From the rack, the tips can then be picked by pressing the lower end of the pipette
15 into the top part of the tip without manually touching the tip. Thus also in the case
of a multichannel pipette, all tips can be replaced at the same time, when the rack
includes tips in rows, each row containing exactly the required number of tips. The
rack supplied with the tips naturally increases the productions costs. It also increases
the volume of the dispatch and the amount of waste in the laboratory.

20 In the patent application WO 95/08392, there is introduced a refill pack to be used
together with the tip rack, from which refill pack the empty tip rack can be refilled.
The refill pack includes several layers of tips stacked in a telescopic fashion. The
lowest layer rests in holes provided in a carrier plate, wherefrom it is pushed
through the plate to the rack positioned underneath. In the embodiment illustrated in
25 figure 7, the top layers always rest on the lowest layer. At the edges of the holes
provided in the carrier plate, there are formed radial cuts, so that in between said
cuts, there are left flexible strips, and the tips are supported by said strips. The tip
rack to be refilled is positioned underneath the refill pack, and when the tips are
pressed downwardly from above, the strips give in and the tips are pushed through
30 the holes to the holes provided in the tip rack located underneath. For pressing, the
pack is provided with a special push plate located on top of the topmost tip layer.
The refill pack is surrounded by a shell, and the shell bottom comprises a widening
skirt that facilitates the focusing of the pack above the tip rack. As the tip layers are
one by one released from the bottom of the pack, the push plate is lowered down
35 layer by layer inside the pack. In order to release the last layers, the user must put his

hand deep into the pack. According to figure 11 of said publication, separate support plates are additionally provided between the tip layers.

5 A different type of a refill pack is introduced in EP 985451. In this pack the tips are stacked upside down. From the pack, the tips can be dispensed by to a tip rack which is positioned upside down on top of the topmost tip layer. On top of the topmost layer of tips there is a push plate with a hole for each tip. When dispensing the tips, the rack and the push plate are moved downwards so that the tips settle into the holes of the rack. The holes of the push plate are provided with directly inward extending spring flaps.

10 Summary of the invention

Now a refill pack in accordance with claim 1 has been invented. Some preferable embodiments of the invention are presented in the other claims.

15 The pack comprises a push plate provided with longitudinal springs, which extend from the edge of the aperture towards the narrower end of the tip. These springs support the tip in the aperture at different points along the length of the tips. Preferably there are three springs.

The spring may comprise an arm, which is essentially perpendicular to the push plate, and at the end of the arm, a jet part bent inwards.

20 The tip preferably has a conical bottom part and a wider conical top part. The outer diameter of the bottom edge of the top part is larger than the inner diameter of the top edge. The inner diameter of the top edge of the top part is larger than the outer diameter of the top edge of the lower part. Thus tips can be stacked in a telescopic fashion without them getting stuck.

Brief description of the drawings

25 The appended drawings form part of the detailed description of the invention.

Figure 1 illustrates a pipette tip rack seen in a front-view cross-section.

Figure 2 illustrates a refill pack to be used together with the pipette tip rack of figure 1, seen in cross-section.

Figure 3 is a top-view illustration of the tip push plate provided in the pack.

Figure 4 is an enlarged side-view illustration of one tip and aperture of the push plate.

Figure 5 is a side view illustration of the pack of figure 2.

Figure 6 illustrates in cross-section how the tip rack of figure 1 is refilled from the
5 pack of figure 2.

Figure 7 is a cross-section view of another push plate.

Detailed description of some preferred embodiments of the invention

10 The pipette tip rack 1 according to figure 1 comprises a box 2, with an upwardly widening top part. At the junction of the top and bottom parts, the inner wall of the box is provided with an inward shoulder running along the wall. On top of said shoulder, there is placed an aperture plate 3 with downwardly extending walls. The top surface of the plate includes circular apertures 4 in a 8x12 matrix. In said apertures, there are inserted tips 5. The bottom part of the tips is narrower and the top part wider than the apertures provided in the aperture plate. Thus the tips can be
15 placed in said apertures, and they rest lightly on the aperture edges without getting stuck. The top part of inserted tips remains somewhat below the top edge of the box. From the plate, tips can be attached to a pipette by pressing the bottom end of the pipette to the top end of the tip. Most advantageously the tip rack is made of some plastic suitable for this purpose.

20 The tip 5 has a conical bottom part and a wider conical top part. The outer diameter of the bottom edge of the top part is larger than the inner diameter of the top edge. The inner diameter of the top edge of the top part is larger than the outer diameter of the top edge of the lower part. Thus tips can be stacked in a telescopic fashion without them getting stuck.

25 The refill pack 6 according to figure 2 comprises a bottom plate 7, a push plate 8 and a shell 9. In a matrix corresponding to the apertures 4 of the aperture plate 3 of figure 1, there are provided pins 10. The pins have a wider bottom part and a top part that is narrower than the top part of the tip 5, but otherwise corresponding to the conical shape thereof. To each pin, a tip is positioned upside down. On top of the
30 lowest tip layer, there are stacked additional layers of tips.

On top of the topmost tip layer, there is placed the push plate 8. Said push plate comprises, in correspondence to the matrix of the tip layer, push apertures 11 with a diameter larger than the diameter of the top part of the tip (figure 3). The edge of the

push aperture is provided with three upward extending flexible springs 12. When the plate positioned on top of inverted tips is pressed down, the springs give way, so that the push plate slides to underneath the tips. The smallest diameter of the aperture defined by said springs is larger than the diameter of the bottom end of the
5 top part of the tip. Thus the plate positioned on top of the inverted tips is placed at the top part of the tip.

The spring 12 comprises a vertical arm the upper part (about half) of which is bent inwards forming straight nails. These support the tip 5 effectively on three points so that the tip is placed exactly and reliably on the aperture 4 of the aperture plate 3 in
10 the rack 1. The springs prevent the tips from inclining sideways during dispensing and also place possibly inclined tips correctly vertically when the push plate is placed on the tips.

On both sides of the push plate 8, there are provided two brackets 13 extending to outside the shell 9. The bracket ends are directed in an upwardly inclined position.
15 At the sides of the shell, at each tip layer, there are provided notches 14 where the brackets fit in, when the push plate is placed at the top part of the tips of the layer in question. The shell and the push plate brackets are somewhat flexible, so that the plate can be made to move within the shell by pressing it. Owing to these brackets and notches, the push plate and the tips remain tightly and securely packed inside
20 the pack, although it is turned upside down.

The bottom plate 7 and the push plate 8 are advantageously made of some plastic suitable for the purpose. The shell 9 is advantageously made of some cardboard or carton suitable for the purpose.

When an empty tip rack 1 shall be refilled, it is placed upside down on top of the tip
25 stack contained in an opened refill pack 2, so that the tips 5 match in the apertures 4. Now the top edge of the rack is placed against the push plate 8. At this stage, the push plate is located at the topmost tip layer. The rack is pressed downwards, so that the springs 12 provided in the push plate give way, and the push plate slides through the topmost tip layer. Finally the rack and the pack are together turned around, the
30 grip of the rack is released and the pack is lifted off the rack and turned around again. Figure 6 illustrates how the last layer of the tip stack is dispensed.

During the use and storage of the pack 6, the bottom plate 7 is permanently supported against the bottom of the shell 9. When dispensing the tips 5, the bottom
35 plate is supported via the shell against the table, in which case any special strength is not required of the bottom plate.

In the pack 6, the tips 5 rest on the bottom plate 7, and the push plate 8 only keeps the tips in position in the matrix. During normal transportation and storage, the tips should not be easily pushed through the push plate by accident. During dispensing, the push plate 7 is supported against the rack. The tips remain supported by the push plate only for a short while at the final stage of the dispensing process. Thus any special strength is not required of the push plate, either.

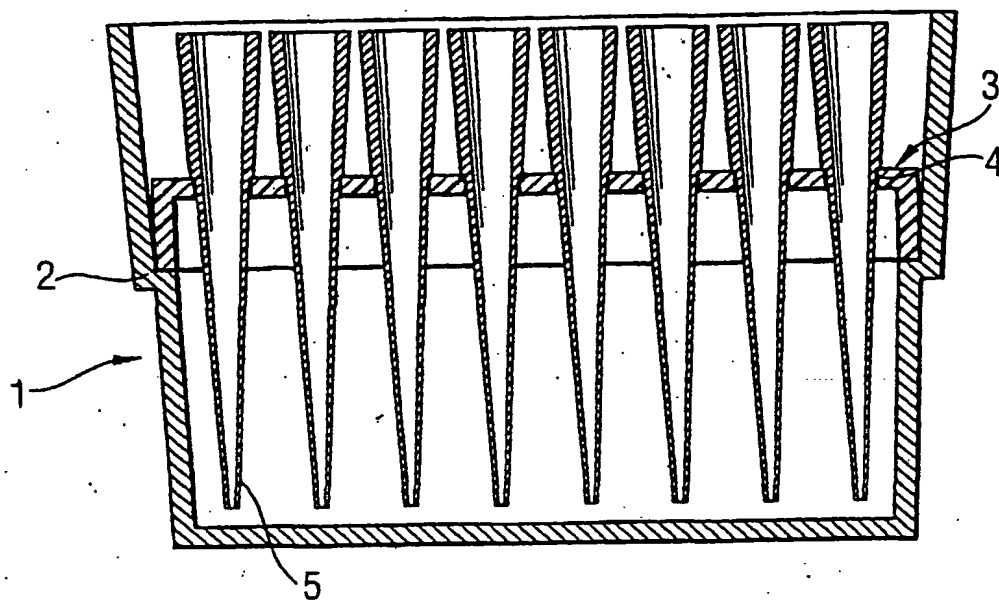
The push plate 8 does not need to hold the tips 5 in the pack during transportation and storage. Thus the springs 12 can be made so that their resisting strength is as small as possible. This is an important advantage, and the more important, the more there are tips in the matrix in question. Owing to the small resisting strength, also the strength required of the pack is smaller, in which case it is further possible to save in material expenses. Moreover, the dispensing is always carried out more pleasantly, the smaller the strength that should be applied.

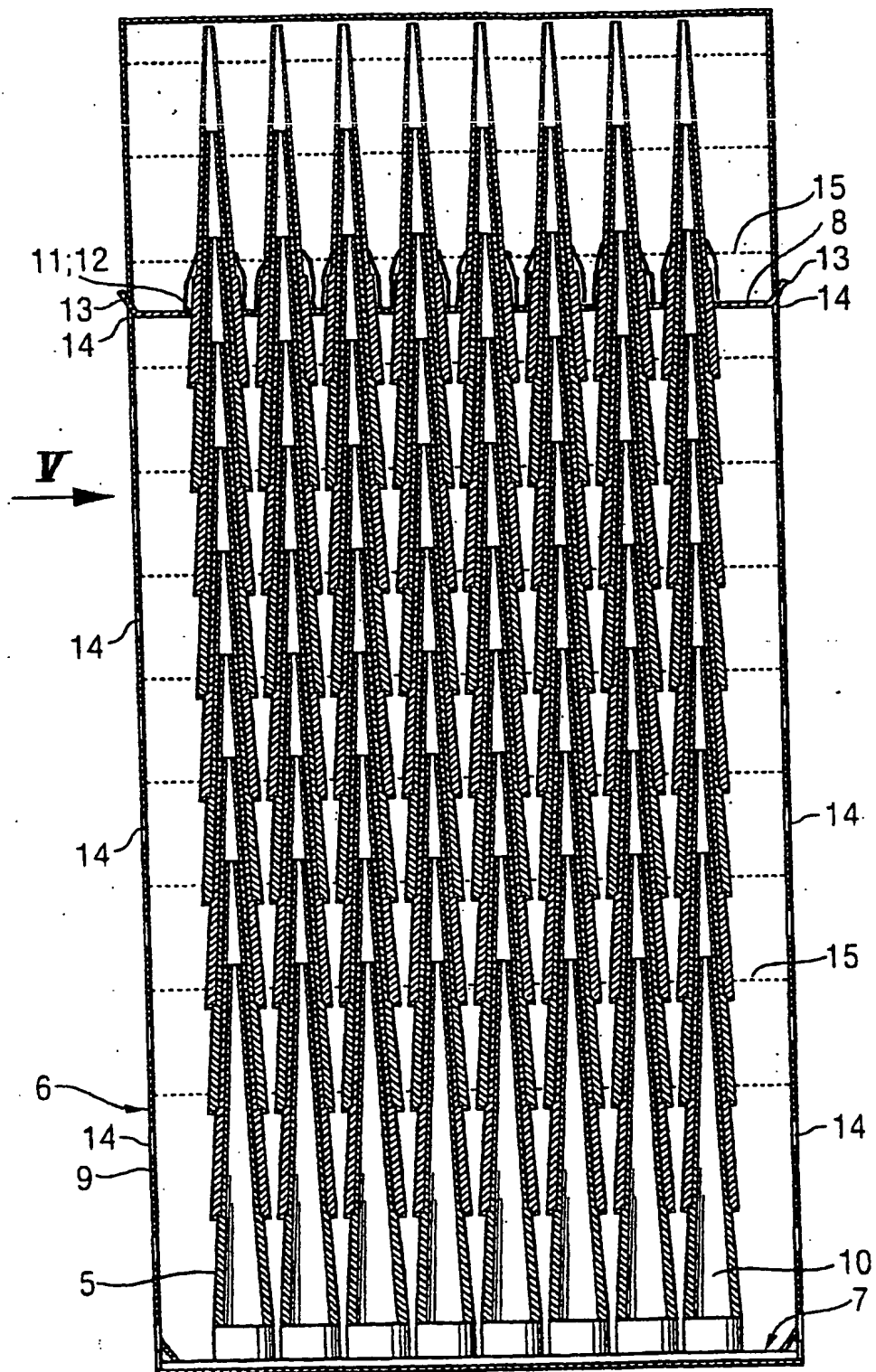
The shell 9 is perforated throughout by horizontal lines 15, so that side walls of the shell are composed of tear-off strips 16. The shell is provided with a lid. Along with removing tip layers from the pack, strips are torn off at the top edge. Thus it is not necessary to insert the rack 1 deep inside the shell. The pack also takes up less and less space along with the dispensing of the tips. Moreover, the user can easily decide, on the basis of the height of the pack, how many tips there are left, even if the shell is made of some opaque material. Between dispensing operations, the shell can be covered with the lid, which now protects the tips from dust, for example.

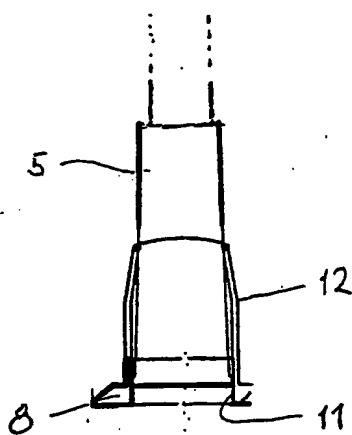
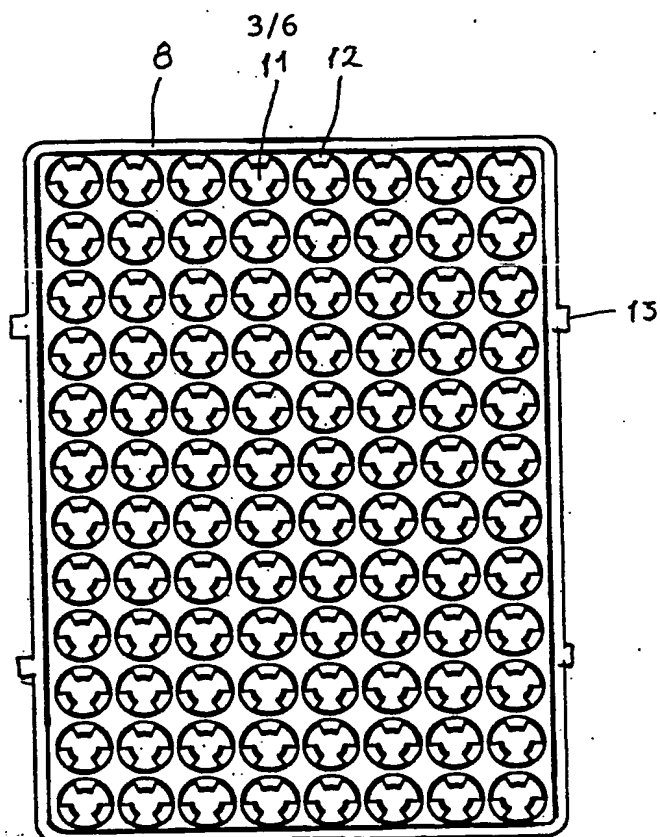
Fig. 7 shows a aperture plate 8.1 by means of which tips 5 can be dispensed from the lower ends of tip columns on the apertures 4 of a rack placed beneath the tip columns. In this case the aperture plate is pulled upwards over the tips. The plate comprises vertical downward walls placed around the rack when dispensing the tips.

Claims

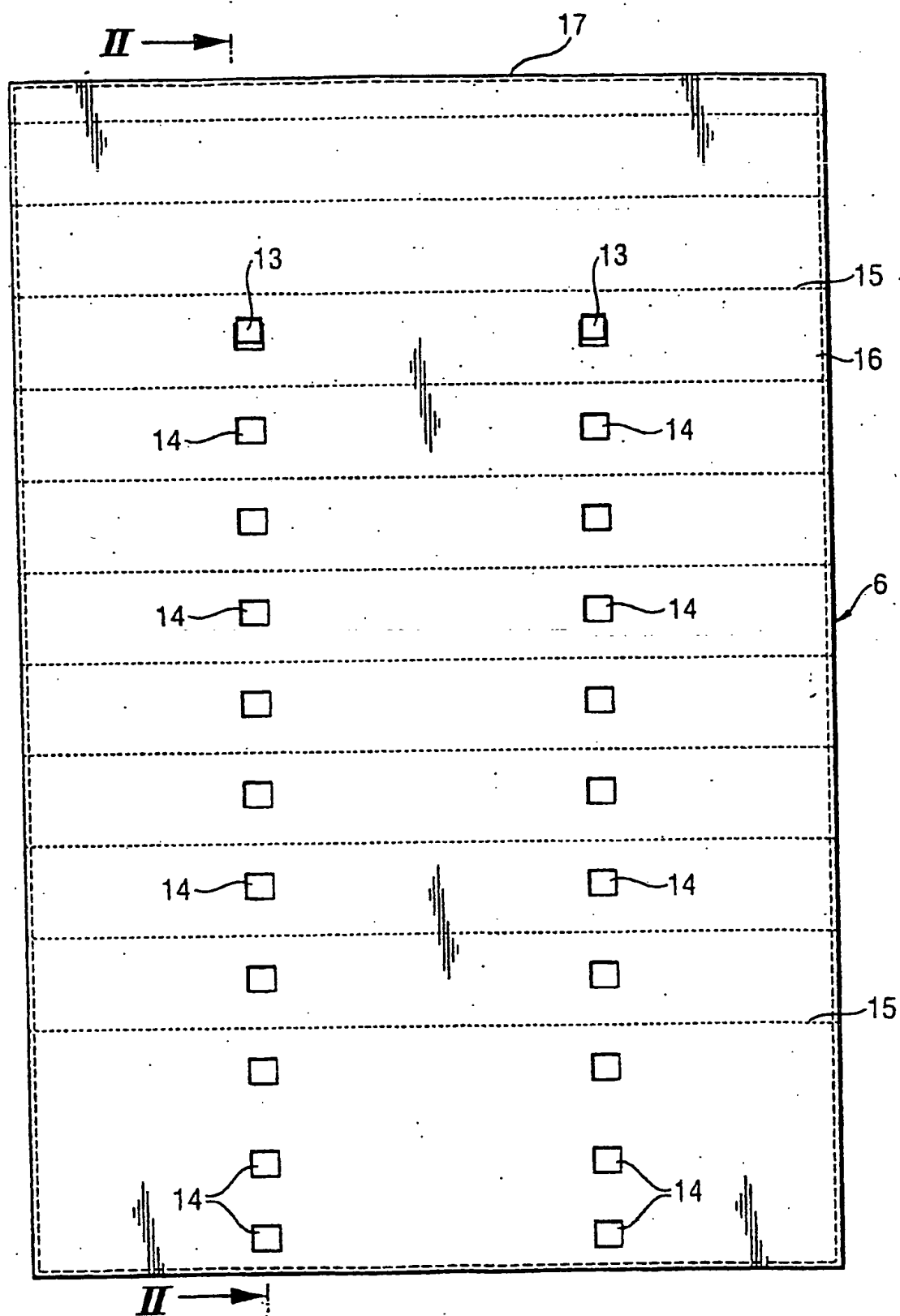
1. A pipette tip refill pack, comprising a plurality of layers of conical pipette tips (5) stacked in a telescopic fashion and a push plate (8; 8.1) with an aperture (11) for each stack of tips, which push plate can be moved through the layers of tips so that the aperture slides over the tip from the narrower end to and past the larger end thereof, characterized in that the aperture (11) is provided with at least two longitudinal springs (12), which support the tip in the aperture at different points along the length of the tip and extend from the edge of the aperture towards the narrower end of the tip (5).
2. A refill pack according to claim 1, wherein there are three springs (12).
3. A refill pack according to claim 1 or 2, wherein the spring (12) comprises an arm, which is essentially perpendicular to the push plate, and at the end of the arm, a jet part bent inwards.
4. A push plate for a pipette tip refill pack, which refill pack comprises a plurality of layers of conical pipette tips (5) stacked in a telescopic fashion, wherein the push plate (8; 8.1) is provided with an aperture (11) for each stack of tips so that the push plate can be moved through the layers of tips so that the aperture slides over the tip from the narrower end to and past the larger end thereof, characterized in that the aperture (11) is provided with at least two longitudinal springs (12), which support the tip in the aperture and extend from the edge of the aperture towards the narrower end of the tip (5).



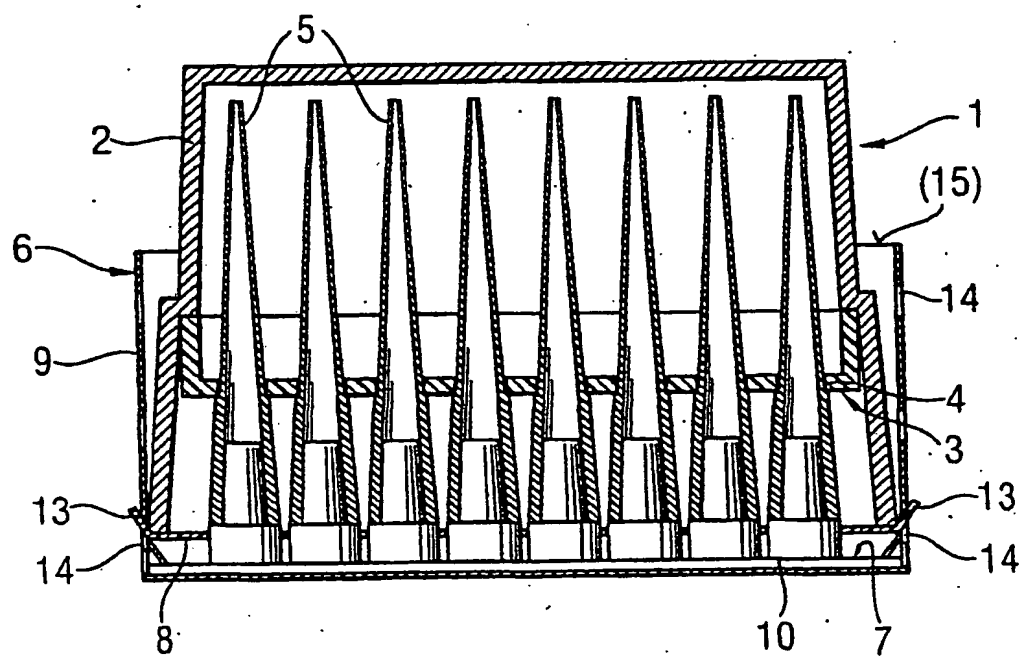




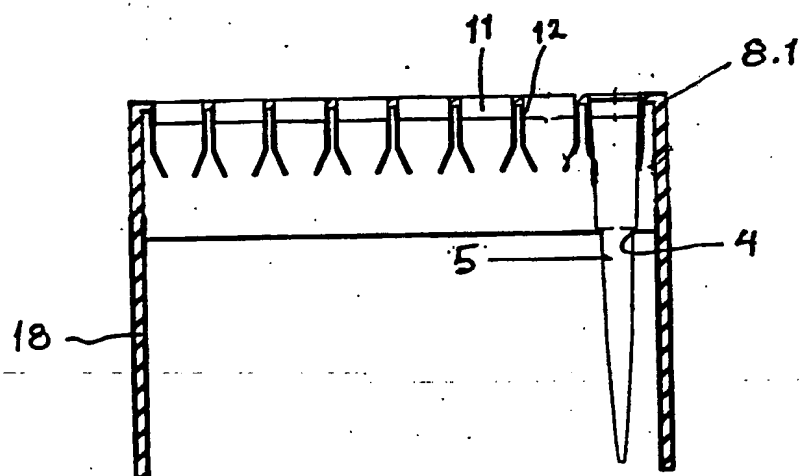
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 02/00921

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B01L 3/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0985451 A2 (LABSYSTEMS OY), 15 March 2000 (15.03.00), see the whole document --	1-4
Y	DE 4419291 A1 (STEINBRENNER, BERNT), 7 December 1995 (07.12.95), figures 10-10d --	1-4
A	US 5392914 A (LEMIEUX ET AL), 28 February 1995 (28.02.95), abstract --	1-4
A	US 5779984 A (C.KELLY ET AL), 14 July 1998 (14.07.98), abstract --	1-4

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

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13 February 2003

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 02/00921

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6286678 B1 (J.S.PETREK), 11 Sept 2001 (11.09.01), abstract -----	1-4

INTERNATIONAL SEARCH REPORT

Information on patent family members

30/12/02

International application No.

PCT/FI 02/00921

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
EP	0985451	A2	15/03/00	FI 981919 D JP 2000084419 A US 6164449 A	00/00/00 28/03/00 26/12/00
DE	4419291	A1	07/12/95	WO 9533563 A	14/12/95
US	5392914	A	28/02/95	DE 69409629 D,T EP 0669856 A,B JP 2772141 B JP 8503911 T WO 9508392 A	05/11/98 06/09/95 02/07/98 30/04/96 30/03/95
US	5779984	A	14/07/98	NONE	
US	6286678	B1	11/09/01	CN 1296455 T EP 1115623 A JP 2002537966 A PL 343823 A TW 434047 B WO 0051899 A	23/05/01 18/07/01 12/11/02 10/09/01 00/00/00 08/09/00